NATLOCK TONE EQUALISING AMPLIFIER AM7/509

Introduction

The AM7/509 accepts the Natlock tone error-signal arriving from a distant signal comparator. It provides gain and equalising adjustments together with level indication and gives out tone error-signals to drive following decoders. If the output signal is too high or too low, the output circuit is broken and an alarm given.

The amplifier is for studio use only and is mounted in a CH1/46B chassis with index-pegs 27 and 41. It includes a PS2/22B power supplier.

General Specification

Input (Natlock tone error-signal)	0dB to -36dB w.r.t. zero level
Input Impedance	600 ohms balanced
Output (Natlock tone error-signal	zero level at 65% full scale reading on indicator
Output Impedance	600 ohms balanced, centre point at E
Alarm	If output level is less than -6dB or greater than +3dB w.r.t. zero level
Equalisation (w.r.t. 1542 Hz)	14 dB attenuation at 893Hz and 1173Hz
Weight	3lb 5oz
Operating Temperature Range	0^{o}C to 45^{o}C
Front Panel Controls	Gain high/low Set gain 1542 Set 893 Set 1173
Front Panel Indicators	Output level meter Limit lamp Mains neon indicator

General Description

The seven tones used in the colour natlock system are 893Hz, 977Hz, 1072Hz, 1173Hz, 1285Hz, 1408Hz and 1542Hz and each represents a different error condition.

The input signal to the AM7/509 consisting of any one of the tones, is first passed through a band-pass filter to remove out-of-band signals. This filter is a simple constant-k type with a nominal impedance of 1·5 kilohms but it is misterminated to reduce the droop in the response near to the band edges.

After equalising to offset the effect of the falling characteristic of the line, the signal is checked for level and, if outside the prescribed limits, a gate is opened and the output is cut completely. When the signal returns to the working range there is a delay of about 3 seconds before the output is restored.

Circuit Description

The circuit of this amplifier is given in Fig. 1. L1, L2, L3, C1, C2 and C3 form the input band-pass filter. The input is tapped down on L1 and this, with R47, gives an input impedance of 600 ohms.

TR1 is the equalising amplifier with emitter followers TR2 and TR3 isolating the frequency-dependent section. The feedback is zero at 1542Hz because of the high impedance of L4 and C5 in parallel resonance; the main gain control R2 is set at this frequency. There is maximum feedback at 893Hz and R8 is set at this frequency. R10 adjusts the mid-range response at 1173Hz. The controls are not completely independent.

TR4 is an amplifier with switched negative-feedback gain control. It feeds an F.E.T. gate via T2 and, direct from its collector, it feeds the detector for the level-indicating and sensing circuits.

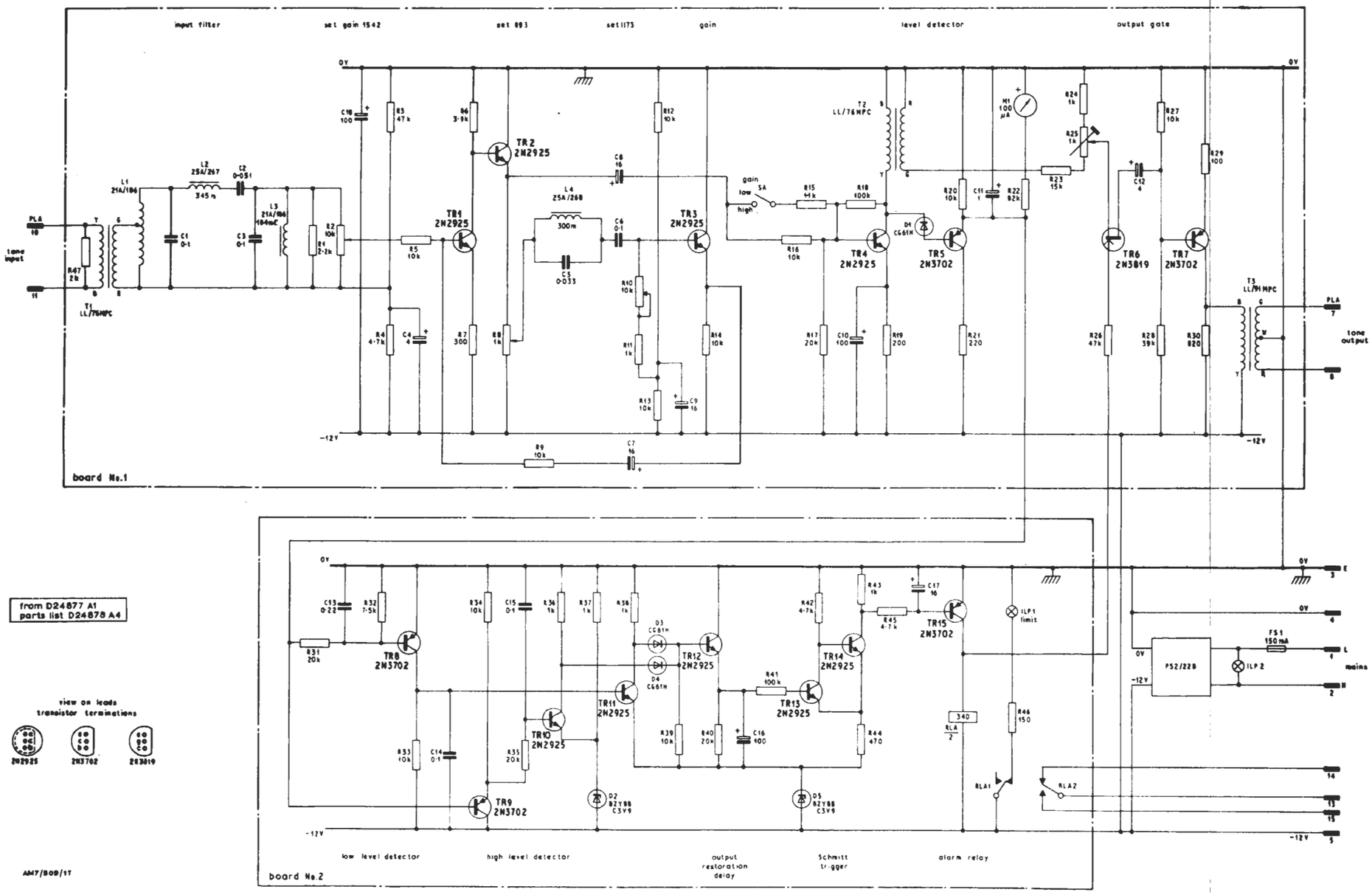
The detector, which is of the so-called infinite impedance type, charges the capacitor C11 and the meter indicates the voltage developed. This voltage drives the low and high voltage-sending detectors TR8 and TR9. Diode D1 protects against base/emitter breakdown in TR5.

Under normal conditions with specified signal levels, the circuit conditions are as follows. TR8 and TR11 (low-level sensing) conduct with D3 and TR12 cut off. TR9 conducts but not sufficiently to pull down the base of TR10 to the cut-off point. The Schmitt trigger TR13/TR14 is unoperated with TR14 conducting. The potential across R43 keeps TR15 conducting and so RLA is operated and the F.E.T. gate TR6 passes the signal to the output amplifier TR7.

When, under abnormal or fault conditions the output from TR5 is low then TR8 ceases to conduct, TR11 cuts off, D3 conducts and TR12 charges C16. The rise of potential on C16 triggers the Schmitt, TR14 and TR15 cut off followed by TR6 which cuts the output signal. RLA releases and ILP lights.

If the signal becomes too high TR9 conducts heavily, TR10 cuts off, D4 conducts and again C16 is charged by TR12.

When the signal returns to normal TR12 cuts off, C16 discharges, after about 3 seconds the Schmitt reverts to normal and the output is restored. The delay reduces errors that could be caused by intermittent or incorrect input signals.



Note
The following components are fitted to front panel:
M1, ILP1, ILP2, SA, R2, R8, R10

Fig. 1. Circuit of the Natlock Tone Equalising Amplifier AM7/509

Maintenance

Routine maintenence is not required. Lining-up procedure, carried out in conjunction with the remote signal source, is indicated below.

1. Set the gain switch to *Low* and other controls fully clockwise.
2. With an input of 1542Hz adjust R2, *Set Gain 1542*, to give a meter reading halfway between the red sectors of the meter scale (if necessary switch to high gain).
3. With an input of 893Hz adjust R8, *Set 893*, for a similar reading.
4. With an input of 1174Hz adjust R10, *Set 1173*, for a similar reading.
5. Check 1542Hz again and repeat 2, 3, and 4 as necessary to get the best approach to a level response.
6. Finally, adjust *Set Gain 1542* so that the meter reads on the white portion of the scale for all frequencies concerned.
7. The preset R25, should not need adjustment. It is set during manufacturing tests so that the output level is –6dB w.r.t. zero level with the minimum input signal.

References

1. Designs Department Specification No.10.48(69)
2. Designs Department Memorandum No.10.28(70)
3. *Picture Source Synchronising:* Instruction P.1, BBC Engineering Practice.

AIB 3/71